Perspectives on Active Preventive Measures of Wuhan People against COVID-19 Epidemic at Home: A Comparative Study

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Summary

Background: The COVID-19 Epidemic emerged in Wuhan, Hubei province, China. Ever since Wuhan lockdown on January 23rd, mass quarantines were exercised on Wuhan and other epidemic areas of China. We aimed to clarify how ordinary Wuhan people defend against COVID-19 epidemic at home through the Internet survey.

Methods： A questionnaire survey, consisting of 30 questions were posted on the Internet. The following aspects were investigated: household preventive measures, self-monitoring of discomfort symptoms, immunity boosting against the epidemic, frequency and reasons of outgoing and mental status of the isolated people. The questionnaire was circulated on Wechat. We marked the areas based on the surveyed network IP addresses and categorized respondents into group A(Wuhan), B(Hubei Province excluding Wuhan), C, and D based on the epidemic severity of their areas announced by Baidu.com at 17:00 on February 8, 2020. And a comparative study was conducted to illustrate how Wuhan people took the anti-COVID-19 strategies and how efficient these preventive measures were.

Findings： In terms of discomfort symptoms, Wuhan, as Group A, had the lowest asymptomatic percentages (70.2%), compared to the average 78.5% (±7%). Considering the three typical symptoms for the COVID-19, i.e., cough, fever and fatigue, Wuhan (9.67%) greatly deviated from the average (7.68%). The fatigue was the most significant factor in the deviation, exceeding the average by 1.35%. In terms of household protection measures, most people or families were able to take effective protection measures with very low frequency of going out, but the percentage of those who took this practice was obviously smaller in Wuhan and Hubei Province. From the aspect of going out, most of the people in Wuhan only went out for shopping and work, with a small number of people for social gathering. In terms of immunity boosting, compared with Group C and D, it was relatively lower in Wuhan. Overall, most people chose to enhance their immunity through regular schedule, exercise, sufficient nutrition. Only 33.44% of people in Group A did not go out, and 59.97% had to go out for living supplies, which was the highest level among the four groups. However, the percentage of people who went out for work and unnecessary activities remains the lowest while 1% of the population went out for public welfare activities, higher than other groups. Worry about the family health topped all the parameters for all the groups. Among them, Wuhan has reached a maximum of 49.61%, higher than the average level of 36.62% (± 10.69%). Mental status except for feeling bored and lonely were the highest in Wuhan.

Suggestions： When the epidemic prevention and control is still in a sticky state, and Wuhan started a stricter control measure, the closed management of communities, on Feb 11, 2020, it is expected that our findings can provide some insights into the current household preventive actions and arouse more attentions of the public to some ignored preventive precautions. Unnecessary outgoing should be strictly abandoned. Regular schedule, exercises and nutrition were the top 3 measures participants would choose to enhance their own immunity system. It seems that people in Wuhan would choose nutrition and regular scheduler rather than exercises as the primary immunity-boosting ways. Exercise should be especially advocated as an effective way to enhance the immunity system. In terms of physical condition, people in Wuhan should take more active measures when symptoms occurred. The mentality is also an important aspect requiring intensive attention with the conduct of stricter control management in Wuhan while the rest groups gradually resume to

work and ordinary life.

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Introduction

In December, 2019, a novel coronavirus, COVID-19(2019-nCov), outbreak of pneumonia emerged in Wuhan, Hubei province, China, and has subsequently garnered attention around the world[1]. As of February 14, 2020,a total of 48,548 laboratory-confirmed cases, including 1,381 deaths (2.8%) had been reported by the National Health Commission of China[2]. To efficiently cope with the COVID-19, the Chinese Government has implemented rapid and comprehensive public health emergency interventions. To date, all of the provincial-level regions in mainland China with confirmed COVID-19 cases have activated the Level-I alert of public health incidents.

Wuhan, as the epicenter of COVID-19, has been locked down ever since January 23rd, followed by other cities in Hubei. To contain the spread of the outbreak, the government of China and other countries have introduced travel restrictions, quarantines of the infected and the suspected, and outdoor restrictions – requiring families to stay at home[3-5]. To limit human-to-human transmission, reduce secondary infections among close contacts, prevent transmission amplification events, clinical professionals worked out a guideline, which was distributed to the all levels of the anti-COVD-19 sectors[6]. Local governments took various preventive and control measures to limit the transmission based on the infection level of each city. Despite of great efforts of Chinese government together with the international support, there are still many gaps in our understanding of the 2019-nCoV and its spreading tendency as well as effective medical treatments[7-11]. Restriction on outdoor activities is still considered to be the most efficient way to reduce virus transmission although the oldest[6,12-14].

Long-term isolation from outdoors may trigger a lot of problems such as including anxiety and depressive disorders, and awareness about the epidemic and preventive measures decreased[15]. Thus it is worthwhile to study the effectiveness of the preventive measures and their effects. From January 30 to February 6, 2020, an online questionnaire was conducted on how the Wuhan families took active preventions against the new coronavirus and 4,348 responses were collected. A comparative study was conducted to explore how people in different areas, defined in terms of epidemic severity, differed in following the guidelines by the government, the awareness of protection against the COVD-19 as well as mental health.

Methods

A questionnaire, consisting of 30 questions was posted the questionnaire service platform, called WenJuanXing (http://www.wjx.com) and circulated on WeChat. At the beginning of the questionnaire, we declared that our purpose was to help people improving the Preventive Measures. We obtained the respondents' consent when they complete the questionnaire. The questionnaire did not involve the privacy and medical information of respondents. And it complied with relevant laws and regulations without any ethical problems.

The regions were identified by IP addresses. The areas where the survey participants were staying were grouped into 4 groups, in the dimension of the epidemic severity (according to Baidu's announcement at 17:00 on February 8, 2020):

I. Group A: Wuhan (the number of confirmed patients is more than 10,000)
II. Group B: Hubei Province (excluding Wuhan)
III. Group C: areas with severe epidemics (the number of confirmed patients is greater than 100), including: Zhejiang, Guangdong, Jiangsu, Beijing, Shanghai, Anhui, Jiangxi, Henan, Shaanxi, Chongqing, Shandong, Sichuan, Hunan, Guangxi, Fujian, Tianjin, and Hebei.
IV. Group D: areas with less epidemic situation (the number of confirmed patients is between 1-100), including the areas are not included in Group A to C.

The demographic data is shown as Table 1. The Respondents of 20-49 years old took the largest proportion and those over 65 years old was the fewest. The sampled age structure met the normal distribution. In our samples, 14 were identified as suspected patients, and 6 were confirmed, accounting for 0.32% and 0.13% of the total samples, respectively.

Results and Discussions

I. Analysis on Discomfort Symptoms

In accordance with the current guidelines for epidemic prevention published by the public health sectors, we selected dyspnea, fever, mild cough, nasal congestion, chest pain, headache, gastrointestinal upset, fatigue, and absence of the above symptoms as options. Wuhan, as the epicenter, had the highest level for all the eight symptom options. Group B had the highest level for 3 symptoms and Group C had the highest level for 2 symptoms. Group B and Group C had the same level for fever. Group A had six symptoms with higher level than the average while Group B had 5 symptoms above the average national level. This, as we suppose, reflected the severity of the outbreak to some extent.

In terms of asymptomatic percentages, the average level of the four Groups was 78.5% (±7%), and that of Wuhan was 70.2%(Figure 1a). Figure 1b shows the symptoms percentage of the four group. The average symptoms percentage of each group was 7.43%, 6.59%, 4.75%, and 5.01%, respectively, with an average level of 5.94% (±1.28%). Wuhan exceeded the average level by 1.48%, seriously deviated. If

we only analyze the 3 typical symptoms of COVID-19, i.e., fever, cough, and fatigue, the four groups are 9.67%, 9.27%, 5.9%, and 5.9%, with an average level of 7.68% (±1.79%), with Wuhan obviously deviated from the average. If we consider cough as a symptom greatly affected by psychological factors, the population with fever in Group A exceeded the average only by 0.005%, which can almost be ignored; the fatigued population percentage exceeded the average by 1.35%. It hints that there may be a certain percentage of potential infections in the respondents of Wuhan.

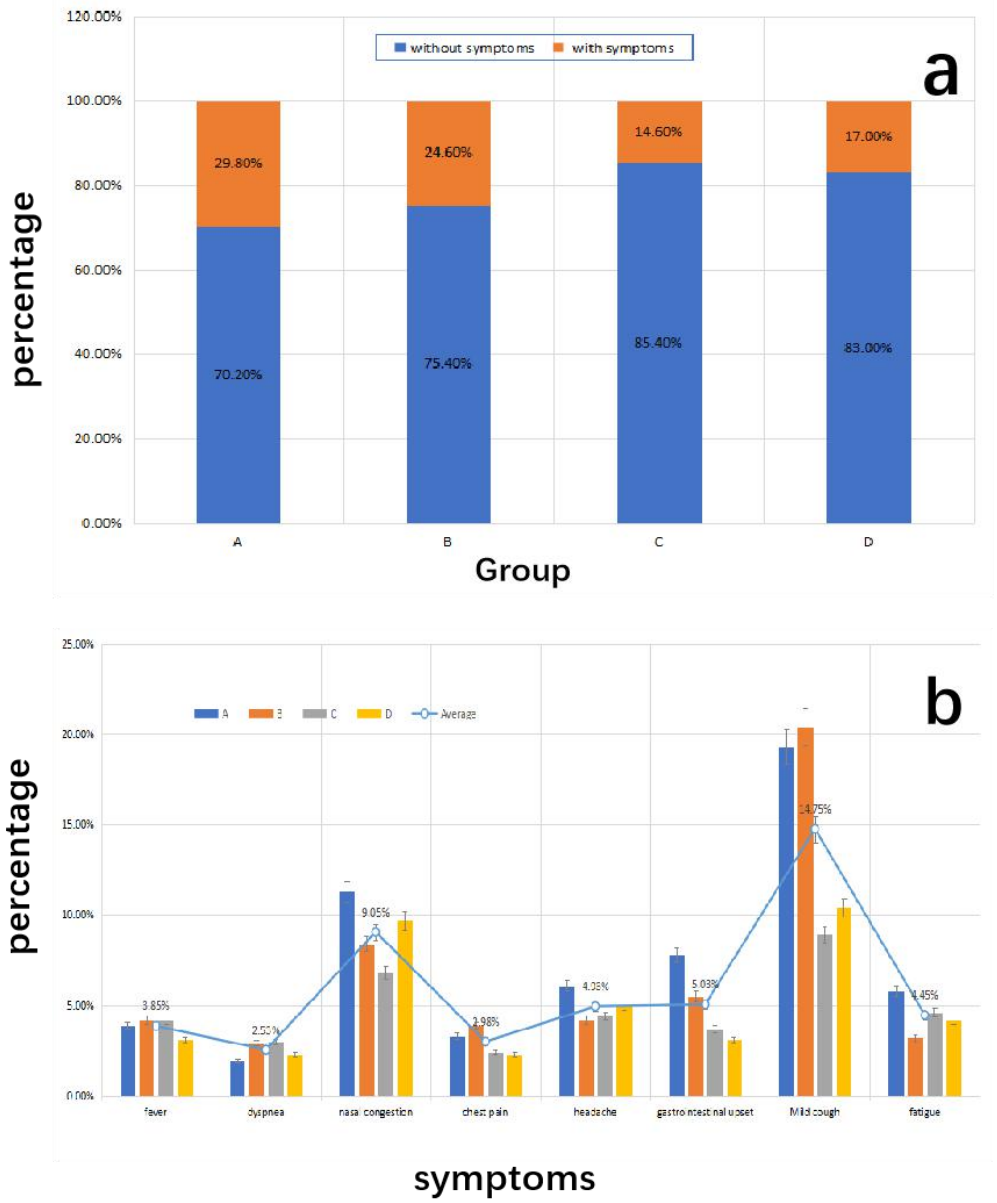

Fig 1. Statistics on Discomfort Symptoms during Staying at Home

II. Analysis on Household Preventive Measures

As recommended by the public health sectors, the main household preventive measures are wearing face mask/respirator while going out, changing clothes and washing hands when entering indoors, regular ventilation, disinfecting the soles,

doorways, toilets, and sewers, leaving the house and going out less frequently. The item “Other measures” is optional.

Figure 2 shows how the main household protective measures were taken among the four groups. As the data shows, the most frequently-used methods are wearing masks, washing hands and frequent room ventilation. The respective averages are: 96.7%, 92.3%, 86.6% while those actions such as changing clothes, disinfecting, and reducing going out gained less attention. Moreover, changing clothes when entering indoors, disinfection of soles, doorways, toilets, and sewer were generally ignored.

Wuhan is the epicenter, but Wuhan topped the other regions only in the item of changing clothes when entering indoor. The measures of wearing a mask, washing hands and frequent ventilation remained the same level with other groups. It is even below the average in taking the other 3 measures. For instance, only 76.8% of the population chose not to go out, the lowest among the four groups. And it maintained the lowest frequency of disinfection as well.

Remarkably, people in Group B took preventive measures under the average level of the whole country, even worse than Group A, Wuhan.

In general, Wuhan and other Hubei cities have taken relatively fewer measures. It may be due to their living habits, or supplies shortage and insufficient attention.

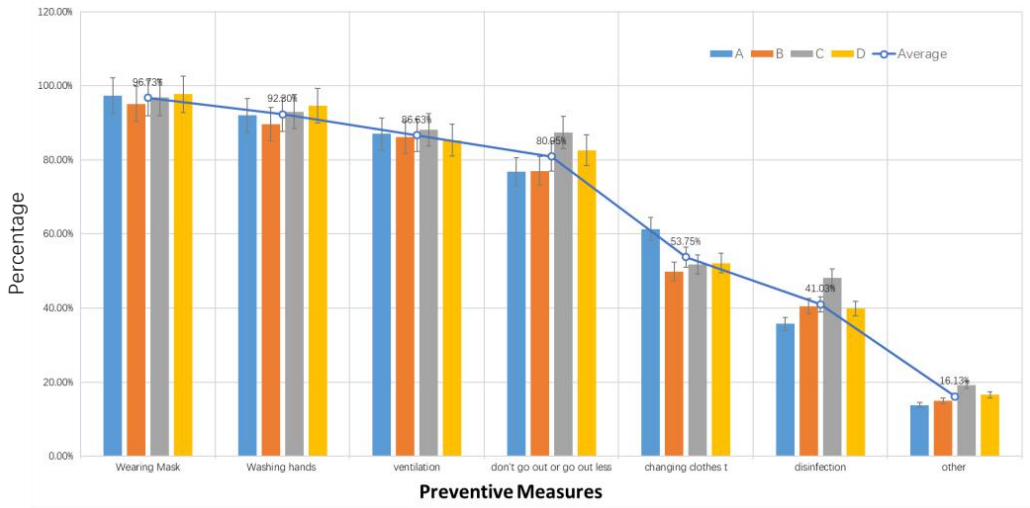

Fig 2. **Statistics on Preventive Measures of 4 Groups**

III. Analysis on Immunity boosting measures against the epidemic

Figure 3 shows the results of measures to enhance human immunity and anti-virus. It can be seen that more than 77% people in the four groups chose to increase their immunity through exercise; 78.5% by improving nutrition; those who use thermo-protection was 32.8%. Wuhan people generally paid more attention to nutrition and heat preservation rather than exercise to improve immunity. However the percentage of taking exercises in Group A was still lower than people of Group C, the highest level (84.4%) by 12%. Therefore, more improvement in all the actions can be made for the future.

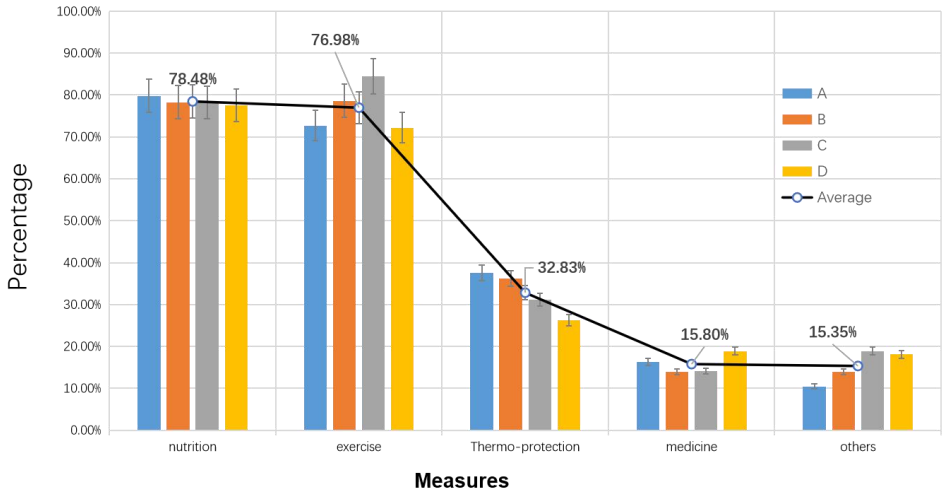

Fig. 3 **Measures taken to enhance immunity against virus**

As shown in Fig 4, the percentage of Wuhan who regarded self as healthy was lower than the average of 94.88% (± 2.27%) by 2.42%. The proportion of those who had symptoms and improved among those who had symptoms was 43.77%. That is to say, 1.36% (2.42%×[1-43.77%]=1.36%) of the Wuhan population had symptoms but did not improve their health by active preventive measures. This part of the population can be regarded as high-risk. Compared with Group B, Wuhan's improvement rate is lower than 36%, validating to certain extent that the infection rate in Wuhan is higher than that in other areas in Hubei. After proactive prevention in Group C, the rate of improvement of physical discomfort is low, which may be caused by psychological panic.

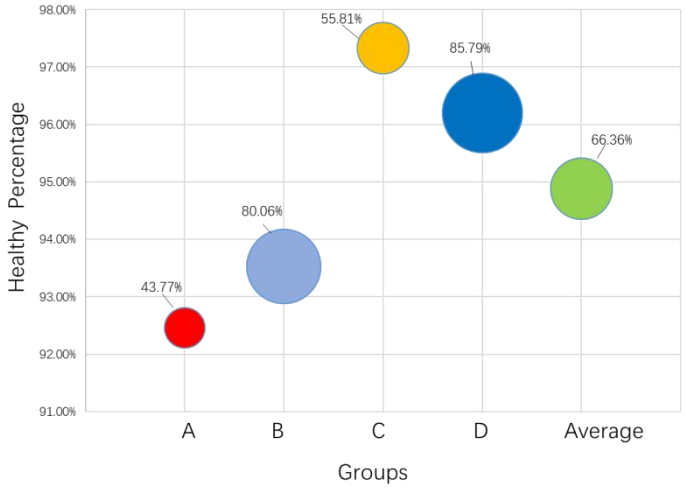

Fig 4. Recovery from Symptoms of People

IV. Analysis on frequencies and reasons of outgoing

As shown in Fig.5, only 33.44% of the Group A people did not go out, and 59.97% had to go out for living supplies. The reason may be that the family need to purchase supplies before the Spring Festival or the psychological preparation was inadequate

and no serious attention was taken; meanwhile, 0.31% of the population in Group A still went out for unnecessary activities. 5.34% of people went out for work, which is the lowest compared to other Groups. 1% of the population went out for public welfare activities, higher than other Groups. It was highly advocated that those devoted into the public welfare should take good preventive actions against infection.

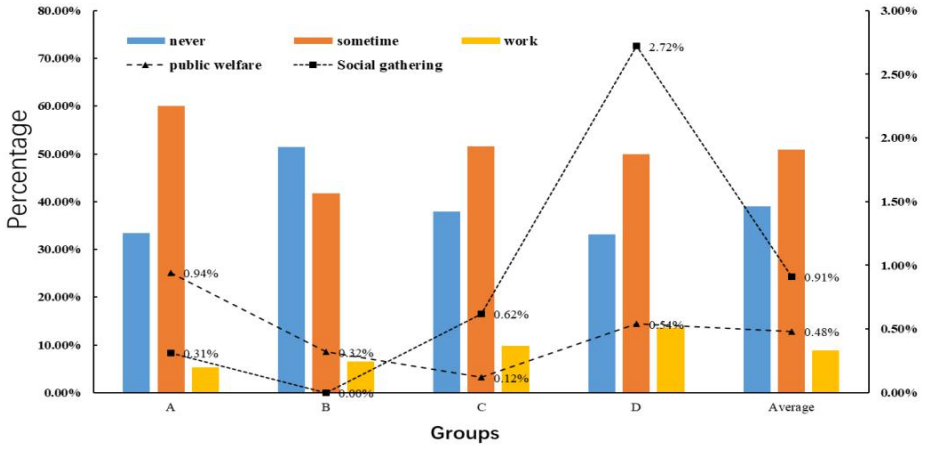

Fig 5. Statistics on Frequencies and Reasons of People Going-out

In the occasions of attending parties, visiting relatives, and other social gatherings, Group B performed the best, indicating that people were taking good actions against infection by avoiding direct contact within Hubei Province. However, the least infected group D had the highest percentage of going out for work or visiting relatives. Although the material reserve was relatively sufficient as publicized by the authorities, people rushed for large amount of purchasing, which is mainly due to the unknown end time of the epidemic.

V. Analysis on Mental Status

Major concerns of the population

Major concerns of the population are shown in Fig 6. Worries about that the outbreak could not be controlled, is the main problem in all groups. Wuhan has the highest proportion, about 37.52%. The percentage of those who had no worry in Wuhan is the lowest, only 12%. It reflects the main mental status of Wuhan people who hoped that the epidemic would be brought under control soon. Moreover, concern for the family health is the highest in Wuhan while the level is the lowest in Group D, which is quite in line with the current situation.

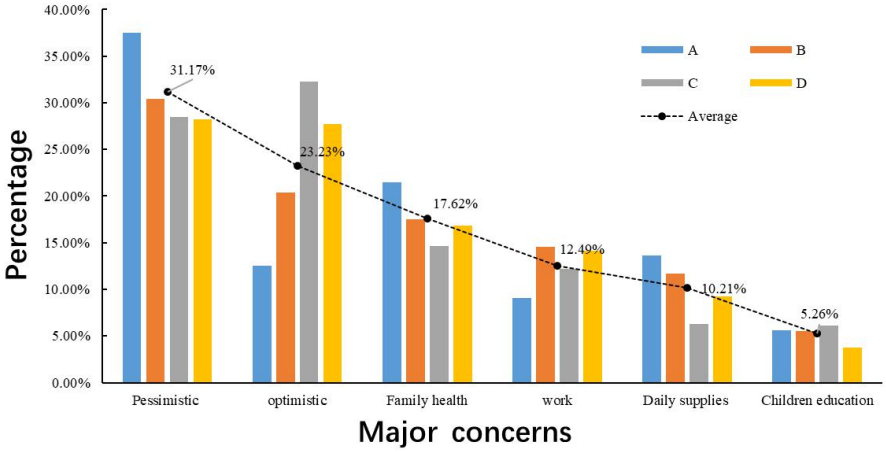

Fig 6. Major cncerns of people isolated at home

Wuhan people also had some problems of household supplies reserves. Wuhan is 7% higher than Group C, and 3.45% higher than the average level (10.21% ± 3.17%), reflecting the panic mental status of Wuhan people. The panics may lead to a higher number of people who did not purchase enough living goods than in other regions. More attentions should be paid to this tendency.

Mental State of the Investigated

Six parameters (Fig 7) are applied to indicate the mental status of people restricted at home. We can see that more than half of people felt the impact was small and enjoyed the stay with their families for all the sampled population while Wuhan is the lowest, only 39.72%, and 12.6% different from the highest; Mental status like the anxiety, worrying about family infection, helplessness and anger emotions are the highest in Wuhan; respondents in Wuhan who felt lonely and bored are basically equal to other regions.

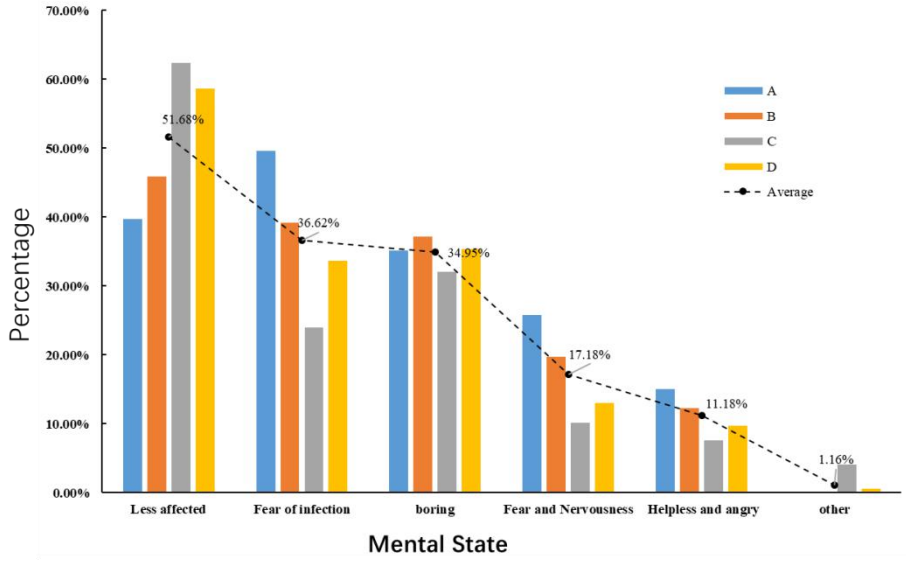

Fig 7. **Mental State of People Being Isolated at Home**

Being worried about the family health topped all the parameters for among all the Groups. Wuhan reached a maximum of 49.61%, higher than the average level of 36.62% (± 10.69%). In addition, Group C had the lowest negative emotional level such as tension and anger. Instead, they felt little affected, which indicates that the people in the region had a more positive mentality.

Lastly, feeling lonely and boring reached an average of about 34.9%, indicating that staying at home for a long time produced some bored emotions, requiring necessary psychological counseling. Feasible methods such as reading and more anti-virus knowledge advertising should be recommended.

Conclusions

According to the results of the Internet questionnaire, analysis was conducted on the household active prevention in Wuhan in terms of the family preventive measures, symptoms, psychological state and going out situation in different regions. As our collected samples, mainly consisting of young adults and healthy people, showed the preventive measures Wuhan people were taking is significantly different from those in other Groups.

In terms of family protection measures, most people or families could take effective protection measures with staying home as the primary precaution, although statistics showed that the percentage of people who took strict outgoing restriction actions was much lower in Wuhan and Hubei Provinces than in other two groups. For the reasons of going out, most of the investigated participants in Wuhan stated as shopping and work, with a small number of people visiting relatives during the Spring Festival days. Any unnecessary going-out might had unpredictable negative effects on this combat.

Regular schedule, exercises and nutrition were the top 3 measures participants would choose to enhance their own immunity system. It seems that people in Wuhan were more likely to choose nutrition and regular schedule as the primary immunity-boosting ways and less reluctant to choose exercises as the primary, compared with participants of other groups.

In terms of physical condition, Wuhan people had the highest percentage of having symptoms as the statistics showed based on the surveyed samples. Thus, when someone is suspected, quick actions should be taken to isolate them in hospitals, reducing the transmission speed effectively.

The mentality is also an important aspect requiring intensive attention. Wuhan participants were obviously nervous, uneasy and anxious. Further investigations should be taken to explore the causes of those negative mental status. Unpredictability on the ending of epidemic might be one reason required to be quantitatively validated. As the rapid improvement of social service system for anti-COVID-19 war, causes for the mental statue may evolved.

With the comprehensive implementation of prevention and control measures in Wuhan and Hubei Province, the epidemic situation in the whole country has been contained to a certain extent. However, the epidemic prevention and control is still in a sticky state, and the situation is still complex and severe. On Feb 11, 2020, when other groups gradually go to the normal track, Wuhan started stricter control measures, implementing closed of communities. It is expected that our findings can provide some insights into the current household preventive actions and arouse more attentions of the public to some ignored preventive precautions. We believe Wuhan People will win the combat against COVID-19 through the active preventive measures.

Contributors

ZX, LZ, YD, SH, ZL, YF, YZ, ZF,TY and FZ made substantial contributions to the study concept and questionnaire design. SH, BQ, HL, CH, ZK, KX, CZ, YW, TH, HD, KH, JL,JT, SX made substantial contributions to data acquisition and analysis. ZX, YZ, ZL,LZ, JT, JH, FZ,TY, KH and YF took responsibility for data interpretation. YF, LZ , YZ and ZX were in charge of the manuscript draft. JH,TY, ZL and ZX designed and drew the pictures and search the literature. All the authors take part in data acquisition and revise the manuscript.

Declaration of interests

We declare no competing interests.

Data sharing

The detailed statistics data can be found in the supplementary materials. Data of questionnaire can be provided after the Article is published.

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